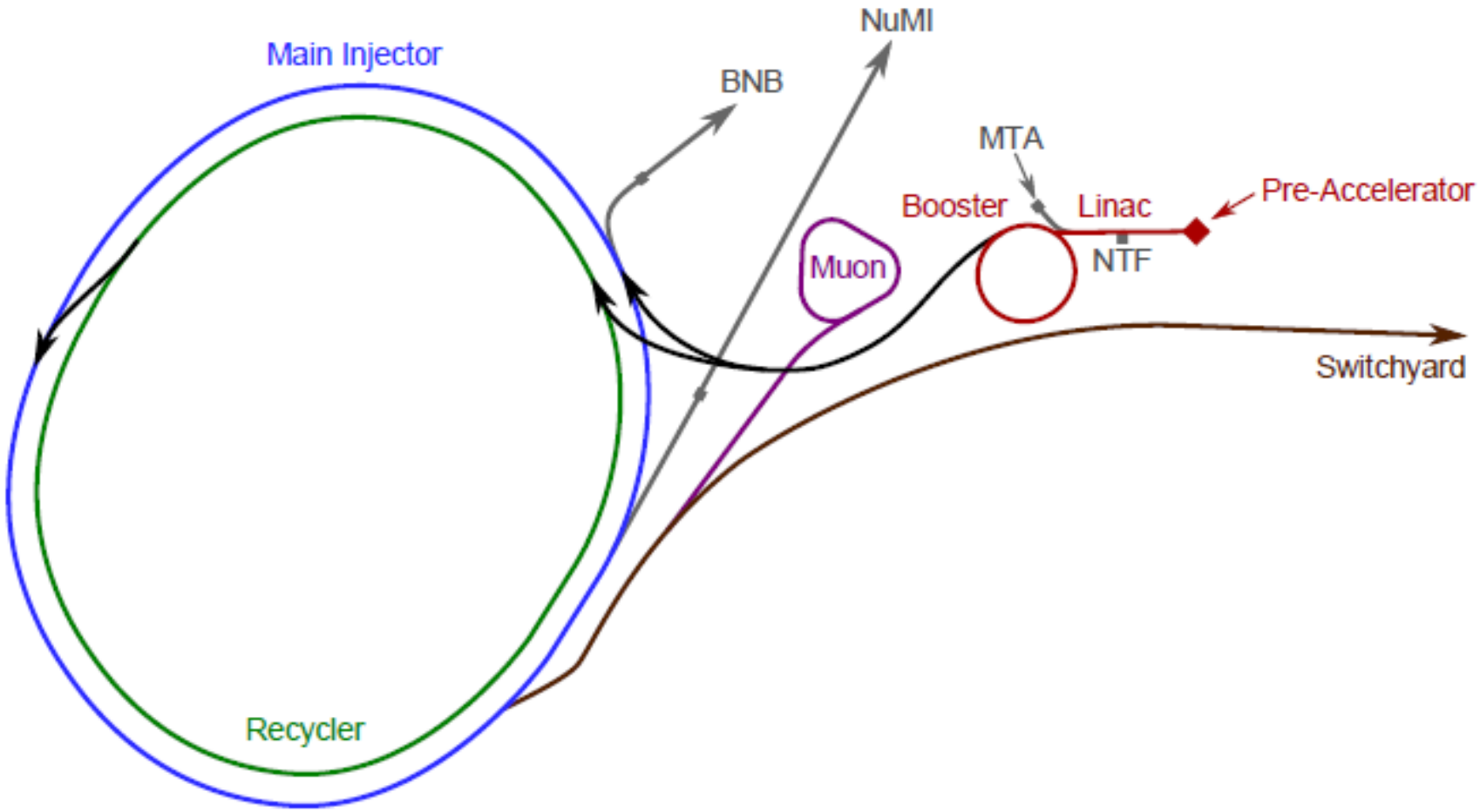
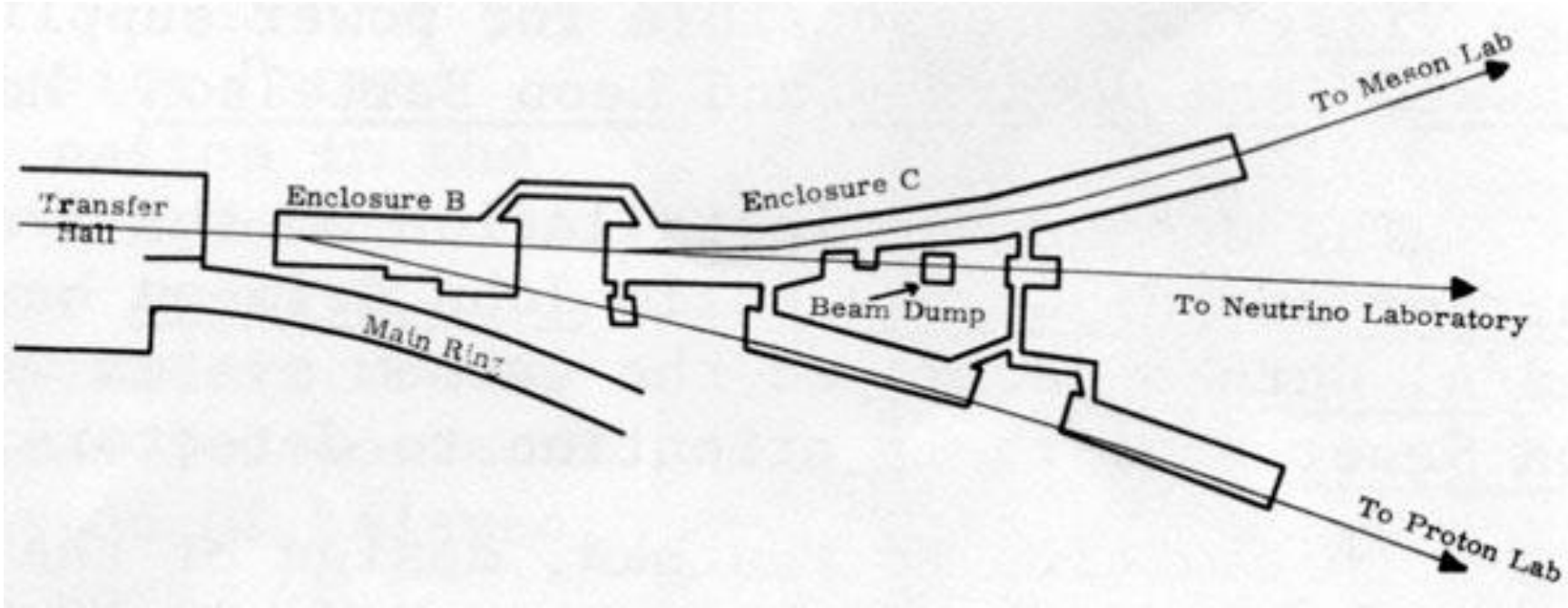
Nova Test Beam

Accelerator and Spectrometer Considerations

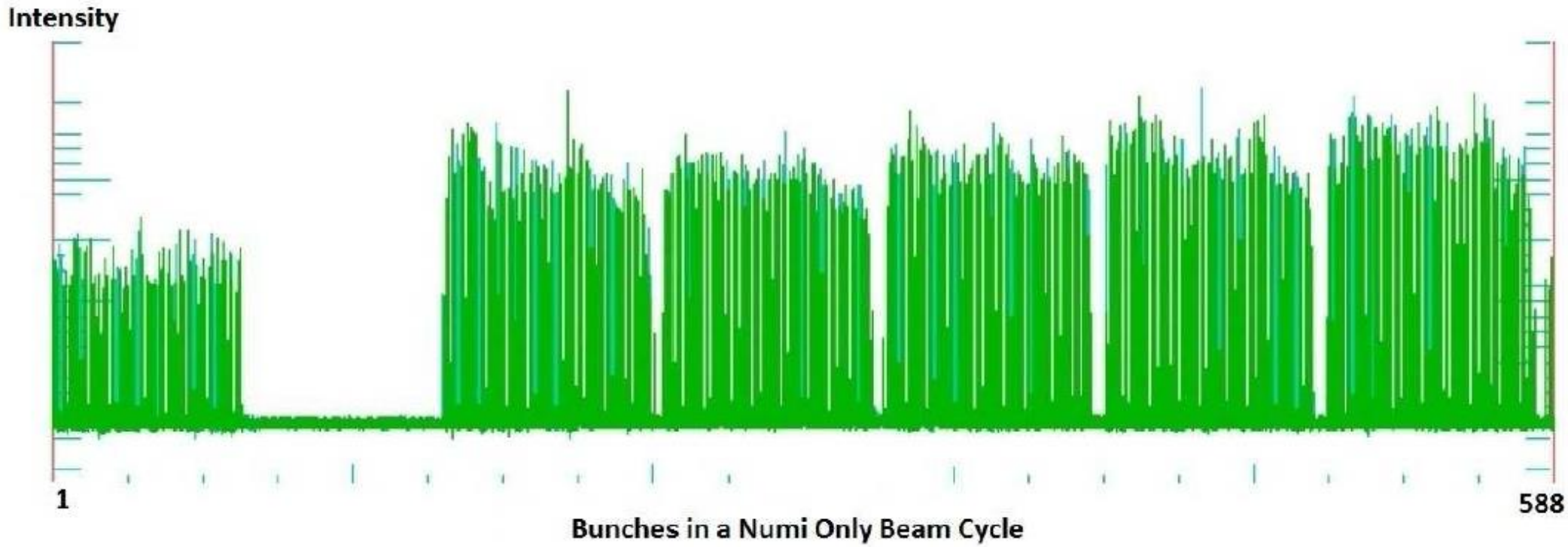
Michael Backfish 6 14 2017

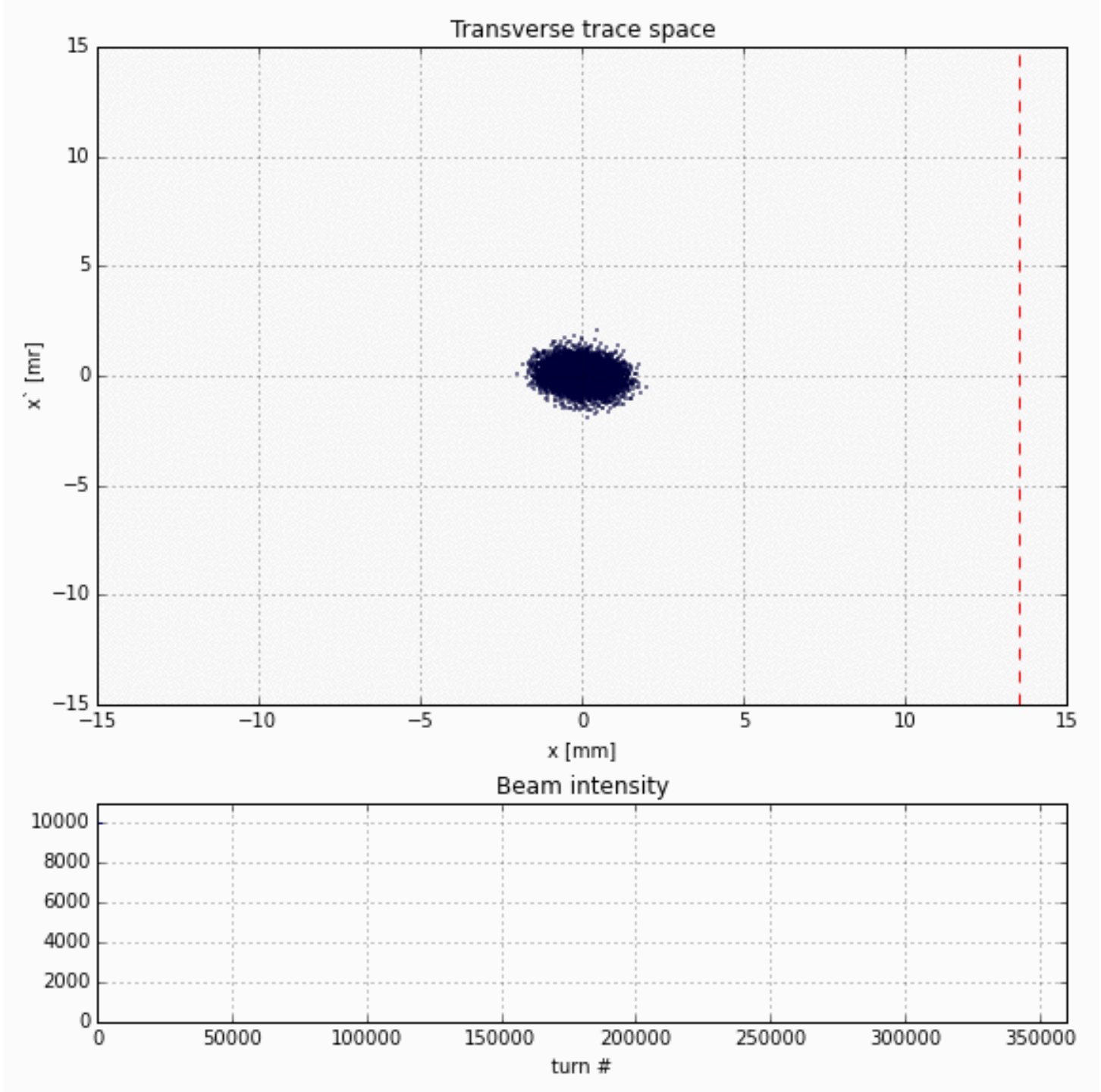


“Switchyard”


To Meson Lab
Transfer Hall
Enclosure B
Enclosure C
Beam Dump
To Neutrino Laboratory
Main Ring
To Proton Lab

MI Bunch Structure




Transverse trace space
x` [mr]
x [mm]
Beam intensity
turn #

Variations Within the Spill

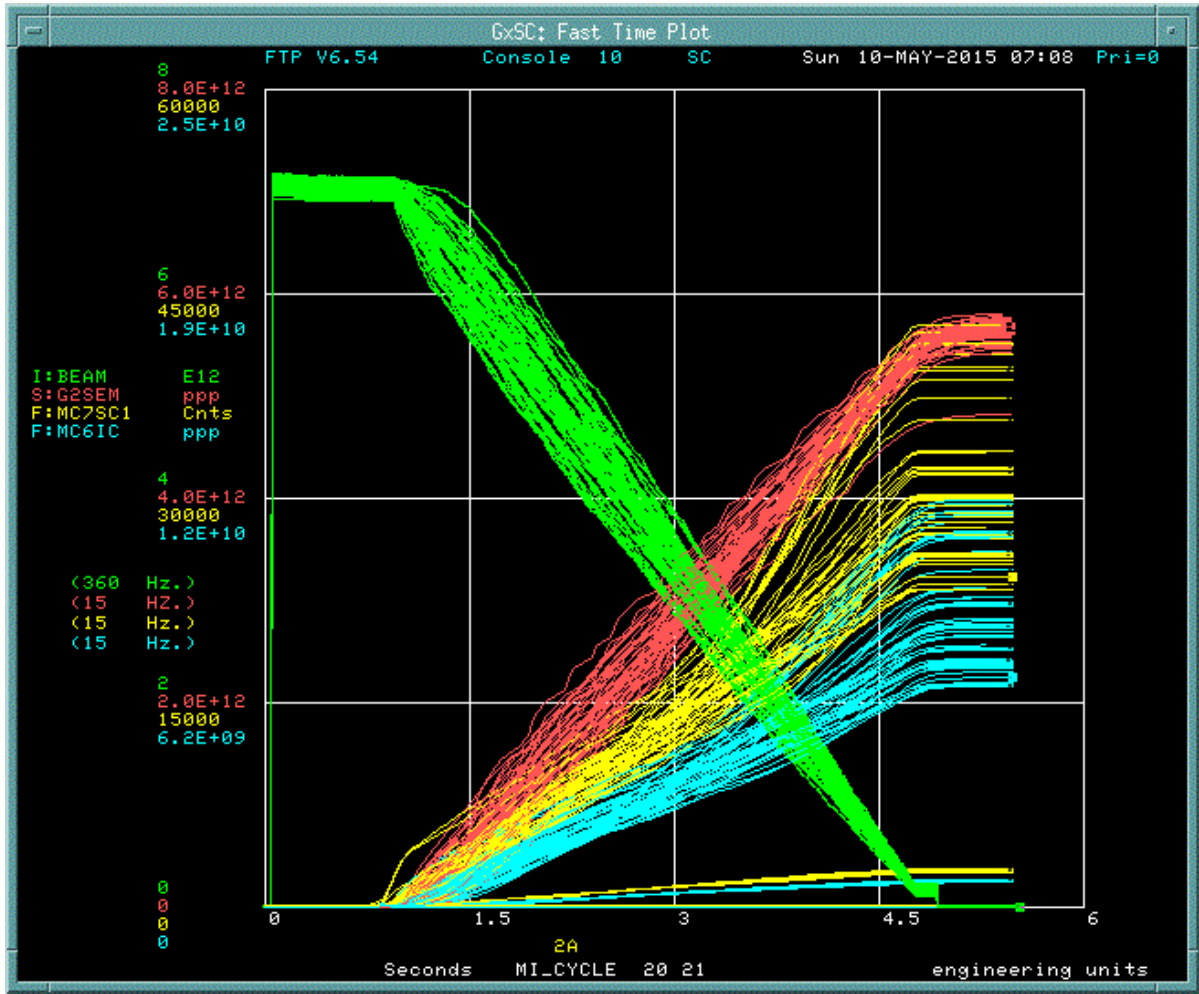
53.1 MHz RF for 4 second spill allows 212,400,000 RF buckets

The maximum intensities that we currently run to Meson Center result in about 1E7 Secondary Particles

On average this is .05 Particles per bucket

In practice FTBF staff claims to rarely detect more than one track per bucket in the FTBF chambers

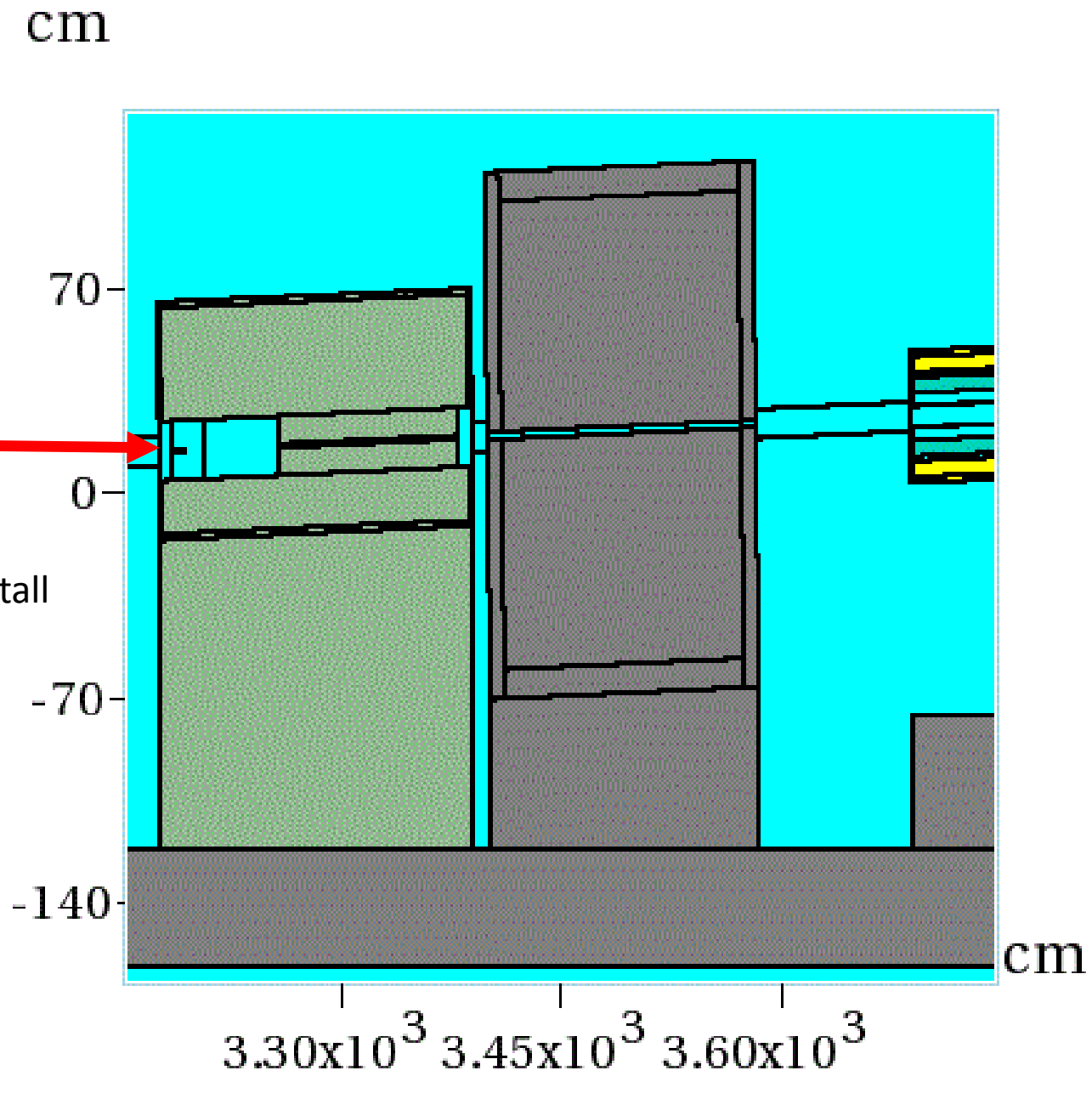
There are often longer time frame variations in the spill as illustrated by the image to the left



120 GeV Primary Beam Target and Shielding

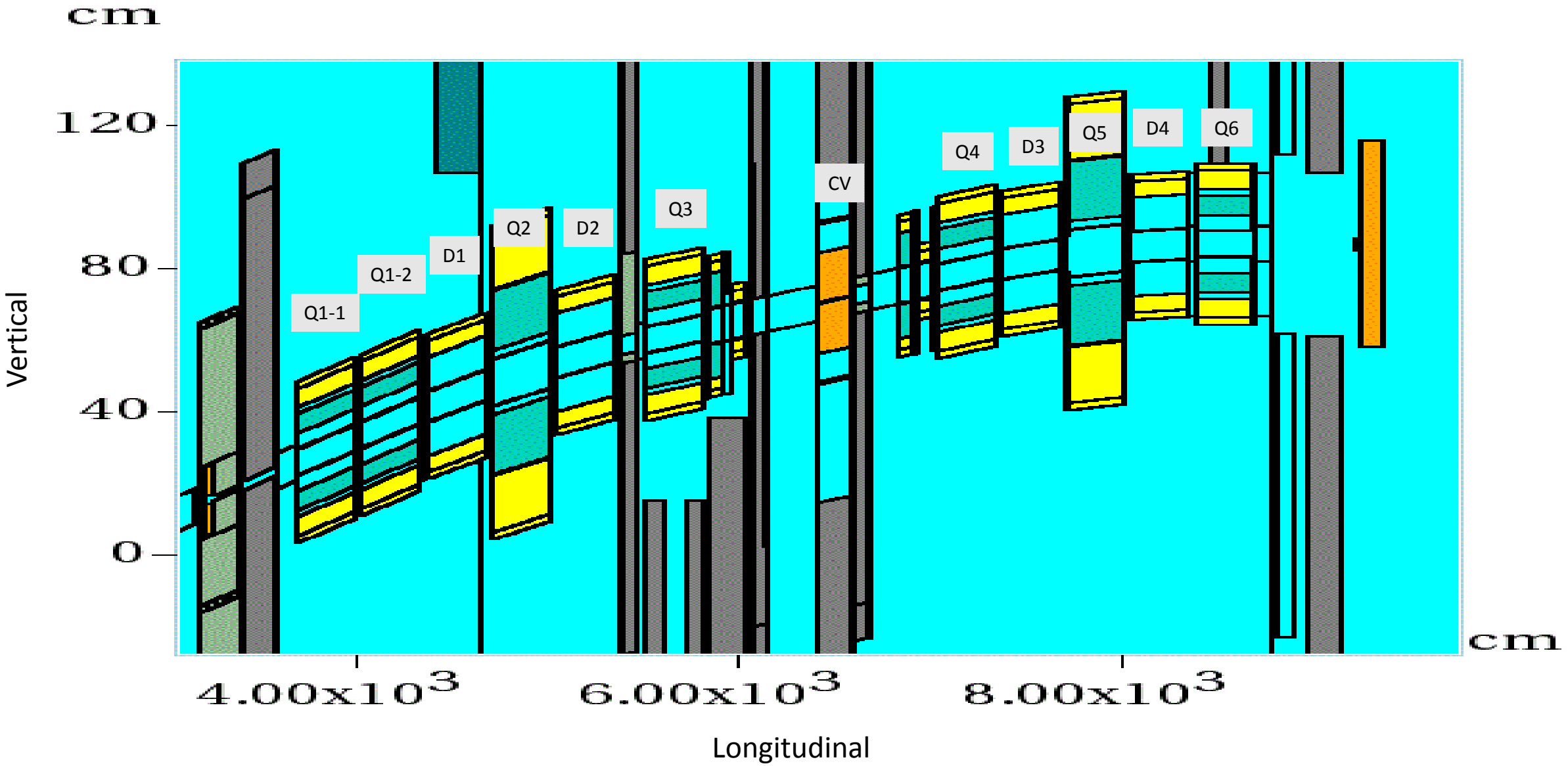
Copper Target

Just under 20 cm long
Just under .5 cm wide by .5 cm tall

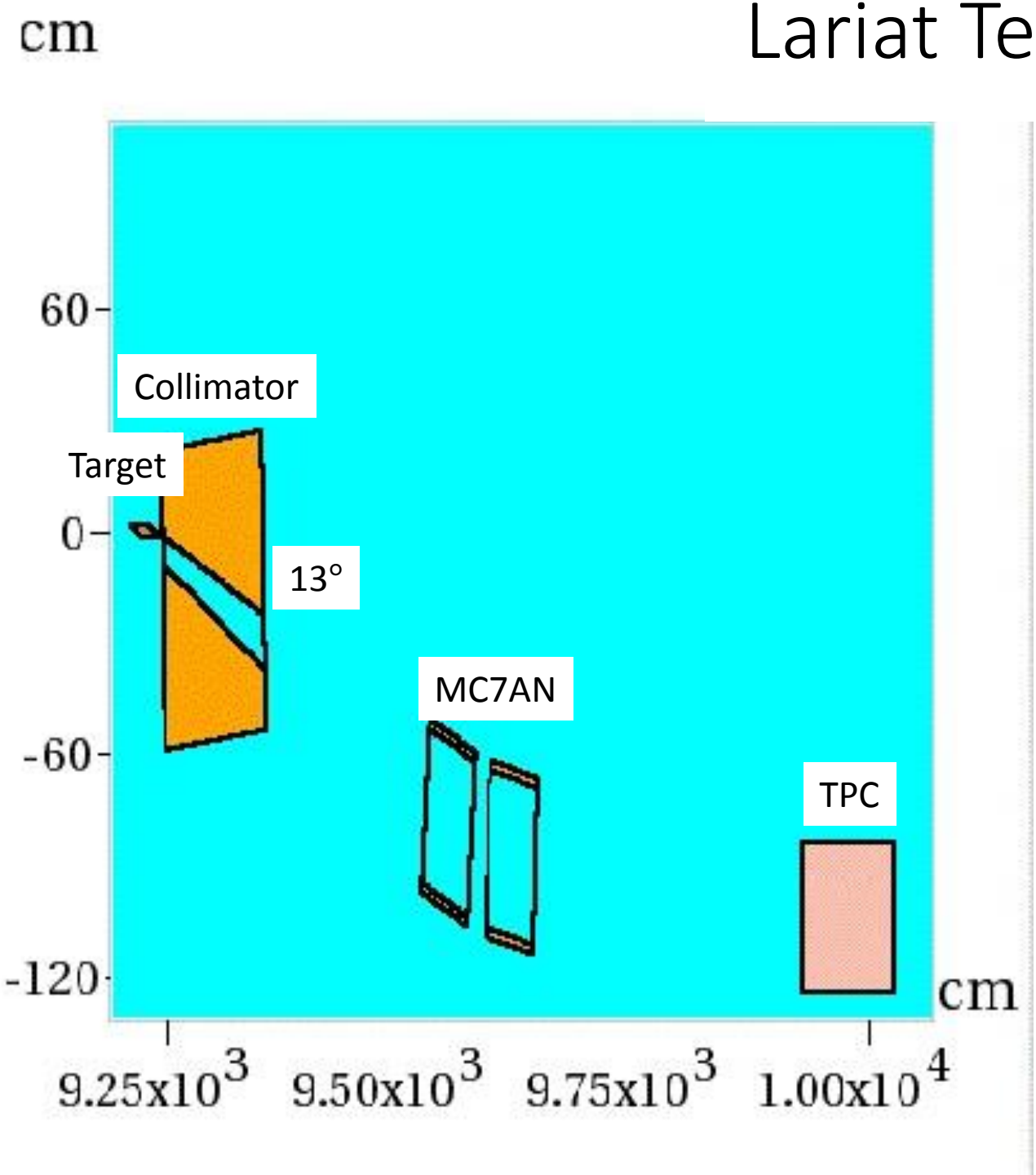


Secondary Beamline (≈ 4 to 80 GeV)

Vertical Momentum Selection accomplished with CV (Vertical Collimator)



Lariat Tertiary



MCAN at 100 Amps Selects 616 MeV Particles
Field rolls off near 100 amps 588 MeV Particles

MCAN at 50 Amps Selects 308 MeV Particles

Wideband 42” Sweeping Dipoles

Former Wideband Sweeping Dipole Specifications

E687 name	M1	M2	M3
steel length	42	42	42
Weight			
Good field without spacer	4	4	4
gap	3.5	3.5	3.5
midplane backleg spacer	1.125	1.125	1.125
Date	4/9/1985	4/9/1985	4/12/1985
FRD # (ResDiv control)	11735	11736	20039
Number of turns	56	56	56
Current	1180	1180	2274
Original gap	2.375	2.375	2.375
Gap	0.089	0.089	0.089
Field	0.934	0.934	1.800
Water flow	10	8.56	8.9
Resistance	0.00517	0.00492	0.005
Voltage	6.10	5.81	11.37
Power	7.20	6.85	25.85
Temperature rise	2.74	3.04	11.04

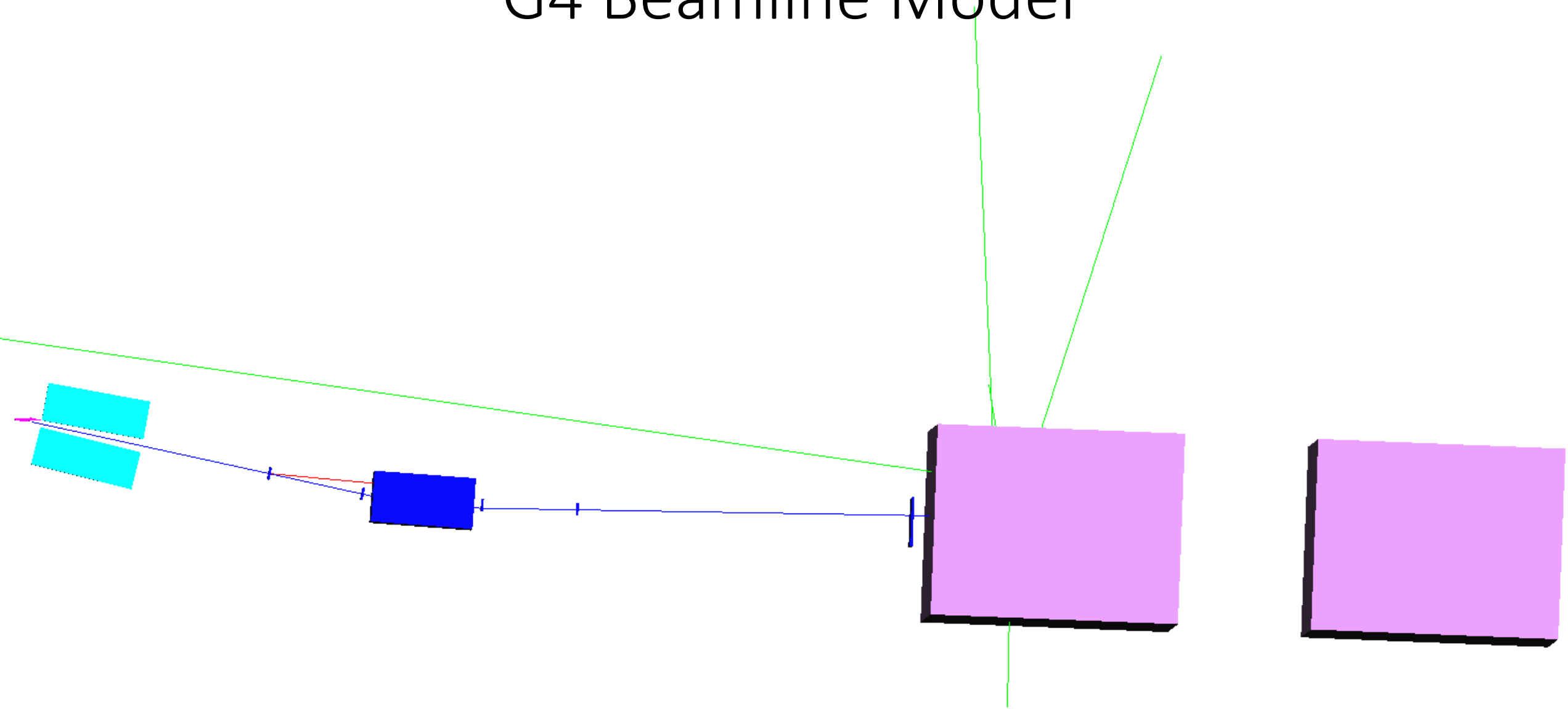
Field Length is length of steel plus ½ Gap at Each (42 in+3.5 in) or 1.1557 Meters

Brho=(10/3) P (With Momentum in GeV/C and B and Brho in Tesla Meters
Brho=BL/deltaTheta (where deltaTheta is the angle and BL is integrated field in Tesla Metes
P=(3/10)BL/deltaTheta (with momentum in GeV/C)

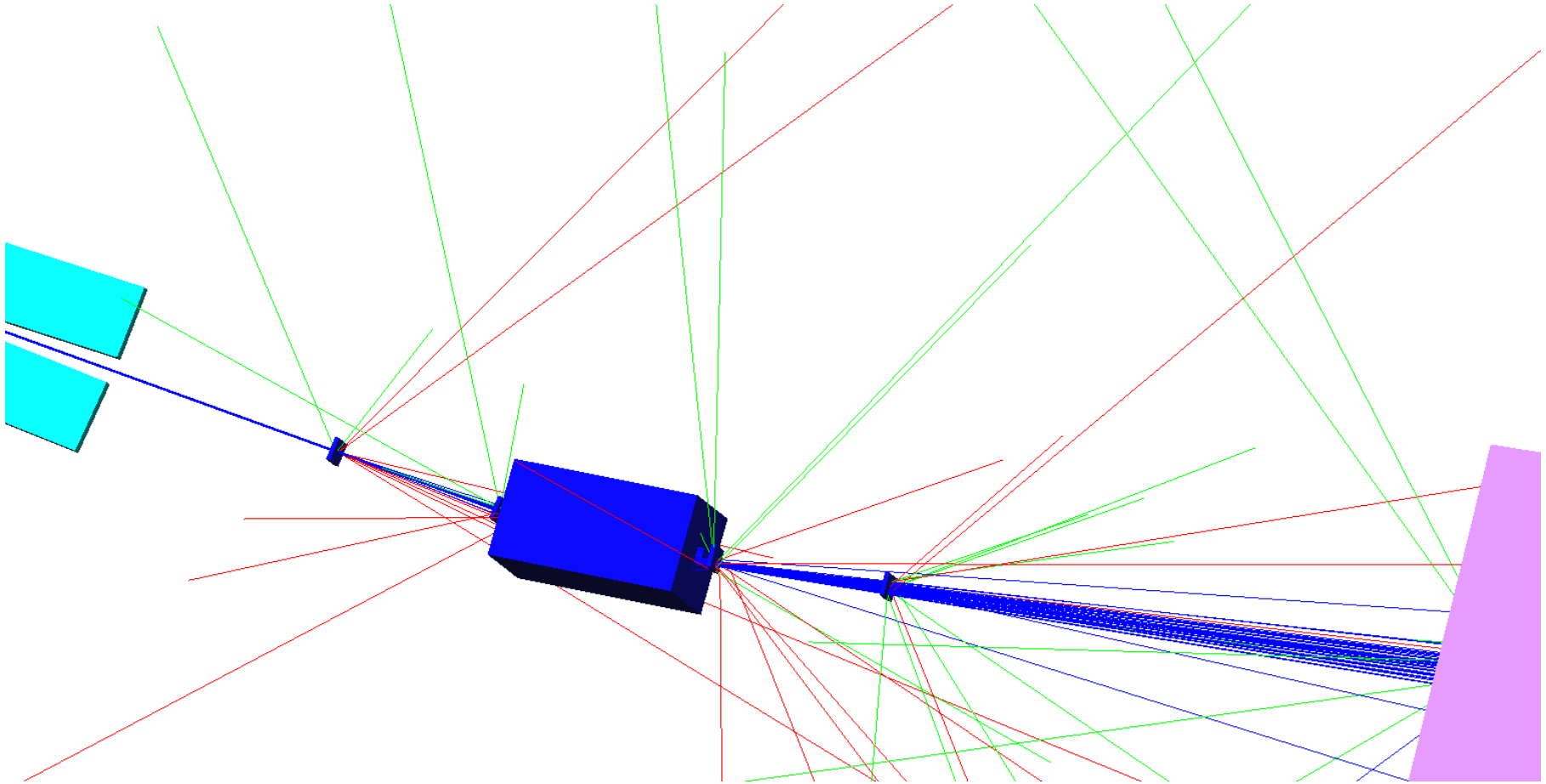
16 Degree is .279253 Radian

Momentum on central axis is 2.235 GeV

G4 Beamline Model



Momentum of 2.05 GeV/C Plus or Minus .1 GeV/C



FTBF Wire Chambers

128 wires 1 mm apart for X and Y planes

dP/P = Dtheta/Theta

A chamber 1.1 meter downstream of the magnet offers an angle distinction of .0324 Degrees
For a 16 degree angle Dtheta/theta is .002 or .2% Momentum Resolution

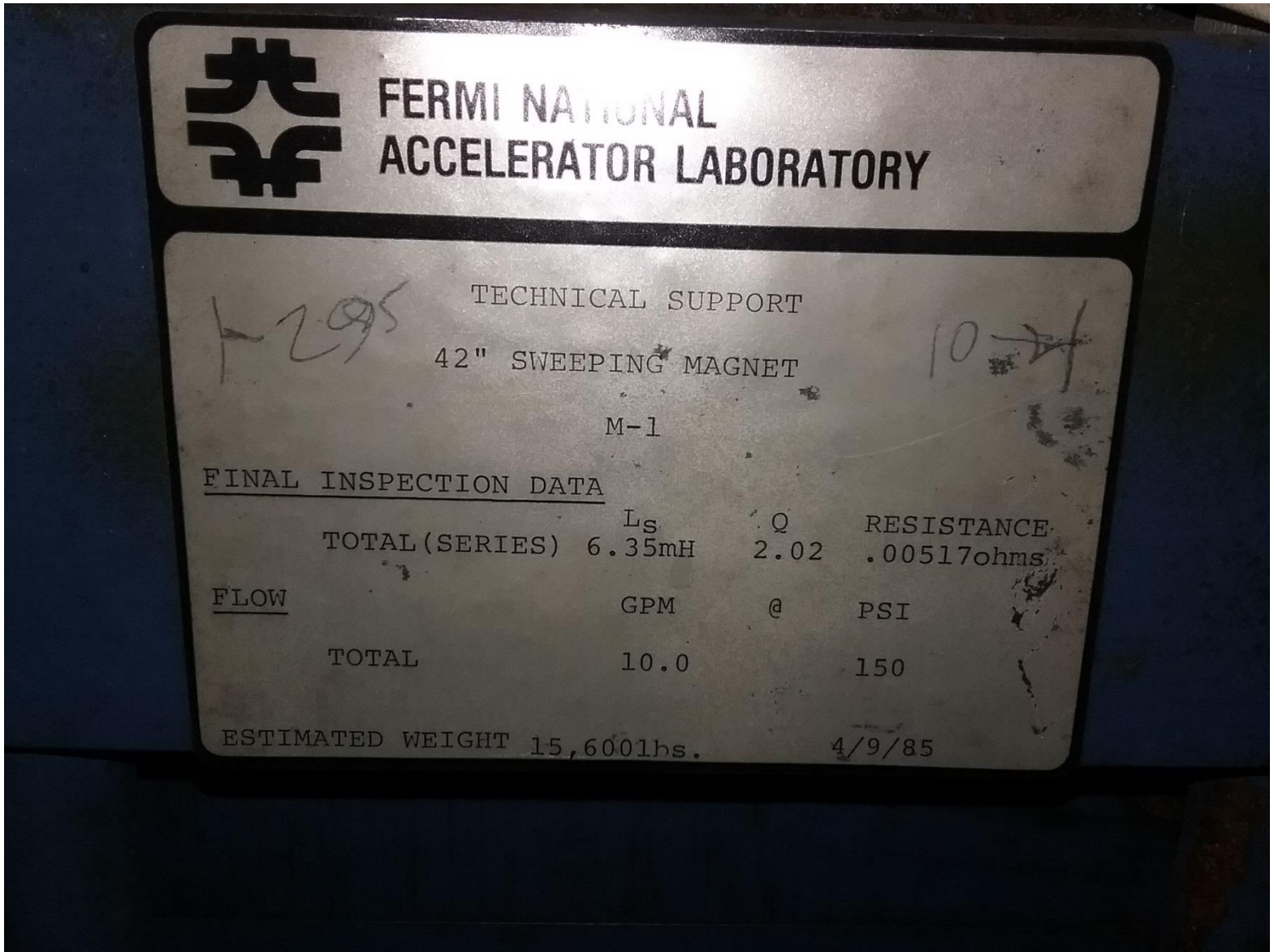
Dave Harding’s Magnetic Field Measurement Recommendations

“Simplest is probably integral Bdl (measured with a rotating coil) as a function of x and current. That gets you the field integral on a straight line, not on a curved trajectory. A 3-D point-by-point map takes much longer, so you wouldn't get as many currents. You can also think about exploring the hysteresis curves to help develop a current changing procedure.”

Path Forward

- This is just one idea of a solution
- Establish whether the floor can hold the weight
- Have technical division test the magnets in situ for inductance
- If this is the correct plan forward then the magnets should be sent to Technical Division for detailed testing

More Magnet Information Including Weight of 15,600 Lbs



The Magnets are in PB6
Protected by Snakes

We Saw At Least 8, but NO mice